Amendments to the Specification:

Please replace the paragraph beginning at page 7, line 10, with the following rewritten paragraphs:

[0019] The following is a specific properties chart showing the density, stiffness and strength properties of various possible materials for use in making baseball bats. All data is taken from standard textbooks available in the field. Specific stiffness and specific strength are actual stiffness and strength divided by density respectively. Strengths for composite materials are given as tensile strength measured along fiber direction in a unidirectional part. Strength for wood is given as the minimum of tensile and compressive ultimate strength. Strength for metal is given as ultimate tensile strength. <u>Unless otherwise indicated, the term "stiffness" as used in this application is equivalent to the modulus of elasticity and is a measure of the change in length of a material under loading. Stiffness or modulus is provided in pounds per square inch (usually Msi or Millions of pounds per square inch). For a tubular body, such as a baseball bat, stiffness of the material can be measured in the axial direction, parallel to the longitudinal axis of the tube or the radial or transverse direction, perpendicular to the longitudinal axis of the tube. Axial "bending stiffness", on the other hand, is a measure of how bendable the tube is along the axial direction. Axial bending stiffness is calculated as a multiple of the axial stiffness or modulus of the material and the second moment of area of the tube and is provided in lbs-in^2. Radial "compression stiffness" is a measure of the force required to depress a section of the tube in the radial or transverse direction. Radial compression stiffness is a product of the radial stiffness or modulus of the material and the thickness and width of the tube, and is provided in pounds per inch.</u>

Materials	Density lbs/ft3	Stiffness Msi	Specific Stiffness	Strength Ksi	Specific Strength
Steel AISI 304	487	30.00	3.90	85.00	10.90
Aluminum 6061-T6	169	10.00	3.70	45.00	16.60
Aluminum 7075-T6	169	10.00	3.70	83.00	30.50

Materials	**Density lbs/ft3**	**Stiffness Msi**	**Specific Stiffness**	**Strength Ksi**	**Specific Strength**
Titanium Ti-75A	283	17.00	3.70	80.00	17.70
High Modulus Graphite	102	38.00	23.30	165.00	100.00
Intermediate Modulus Graphite	102	34.00	19.50	180.00	109.80
Commercial Graphite	98	21.00	13.30	210.00	132.90
E-Glass	130	[1]7.00	3.10	135.00	64.30
S-Glass	124	8.00	4.00	155.00	77.60
Kevlar 49	86	11.00	8.00	210.00	152.20
White Ash	42	2.00	3.00	8.00	12.10
Bigtooth Aspen	27	1.00	2.30	4.00	9.30
Yellow Poplar	29	1.10	2.40	4.50	9.80

[0021] In summary, polymer composite materials can theoretically be employed to manufacture baseball bats, wherein at least the striking portion is tubular and made solely of a polymer composite material, which are both stronger and stiffer than today's predominantly all aluminum tubular baseball bats. However, the two dimensional layered fiber architecture used in current polymer composite materials performs poorly under impact loading conditions such as when baseball bats are impacted by baseballs. Thus, the limited attempts, to date, to commercially produce an all polymer composite baseball bat have largely been unsuccessful, primarily due to premature bat failure or breakage. To improve durability, the wall thickness of the polymer composite tube could be increased, however, increasing wall thickness dramatically increases <u>radial compression</u> stiffness and weight, which in turn lowers bat performance due a

decreased "trampoline" effect as the thicker bat wall springs back less after impacting the ball.

[0030] (cancelled)

[0031(a)] According to another aspect, there is provided a baseball bat comprising: a handle portion for gripping, the handle portion having a handle length; a cylindrical tubular hollow void barrel portion for striking, the barrel portion having a barrel length; and a tapered mid-section portion connecting the handle portion and the barrel portion; the handle, barrel and mid-section portions constructed solely of a polymer composite material, the polymer composite material comprising a thermoset resin and continuous length reinforcement fibers, wherein the continuous length reinforcement fibers in the handle portion have a handle fiber length and the continuous length reinforcement fibers in the barrel portion have a barrel fiber length, and wherein the handle fiber length is greater than the handle length and the barrel fiber length is greater than the barrel length, the continuous length reinforcement fibers being arranged at a resultant fiber angle relative to a central longitudinal axis of the bat, wherein an average of the absolute values of all the resultant fiber angles in the handle portion is less than an average of the absolute values of all the resultant fiber angles in the barrel portion, thereby providing the handle portion with an axial stiffness that is greater than the axial stiffness of the barrel portion, and wherein the axial <u>bending</u> stiffness of the handle portion is between 50,000 [lb/in^2] <u>lb-in^2</u> and 250,000 [lb/in^2] <u>lb-in^2</u>, and the radial <u>compression</u> stiffness of said barrel portion is between [70,000 lb/in^2 and 350,000 lb/in^2] <u>70 lb/in and 350 lb/in</u>.

[0072] Typically, ten to thirty individual layers or laminates, positioned in cylindrical planes defined by length **8** and circumference **9**, are used for existing tubular all polymer composite bats. Since the fiber reinforcements within the layers have much higher physical properties (such as strength) than the polymer matrix, the baseball bat properties in cylindrical planes along length **8** and around circumference **9**, are much greater than the physical properties through thickness **10**. Thus, at a typical laminate boundary **11**, as shown in Figure **1C**, between the layers, also known as the inter-laminar interface, the bat's physical properties are largely determined by the properties of the much weaker polymer resin matrix. For this reason, under impact loading, such as that which occurs in a bat-ball collision, bats having at least the striking

portion **2** constructed solely of a polymer composite material, typically fail interlaminarly (that is, between the laminate layers), at a typical laminate boundary **11**, and typically at much lower physical property (strength) levels than those of the fiber reinforcements. Consequently, the relatively few bat designs attempted to date, having at least the striking portion constructed solely of a polymer composite material, have not been commercially successful due to a lack of durability and premature failure resulting from the use of a two-dimensional fiber reinforcement architecture. In some cases, in an attempt to compensate for the lack of strength under impact loading, the wall thickness **10** of the bats has been increased. Such bats have suffered from poor performance due to increased weight and high <u>radial compression</u> stiffness resulting in little or no "trampoline" effect.

[0091] Further, as demonstrated in laboratory testing (i.e. frequency and model analysis), handle portion **4** of bat **13** has an axial <u>bending</u> stiffness of between 50,000 and 250,000 [lb/in^2] <u>lb-in^2</u> and a first bending mode frequency of between 100 and 600 hertz. Barrel **2** of bat **13** has a transverse or radial <u>compression</u> stiffness of between 70[,000] and 350[,000] lb/in[^{2}], and a first hoop mode frequency of between 800 to 2000 hertz, which both directly relate to the differential stiffness achieved in the handle **4** versus barrel **2** of bat **13**.

[0108] The importance of achieving low and consistently precise physical dimension tolerances is fundamental to achieving optimal bat performance. For example, a larger outside barrel diameter **23** improves bat performance by increasing the trampoline effect. Also, a larger outside barrel diameter **23** increases the hitting surface area and thus increases the probability of contacting the ball. The outside barrel diameter **23** of bats used in competition is regulated to an allowed maximum barrel diameter. This maximum limit must be taken into account so that manufacturing tolerances do not result in bats that exceed the regulated maximums. Because of the exceptionally low tolerances achieved by the applicant's precision molding process, as described herein, bats produced using this process have outside barrel diameters **23** that are capable of being consistently much closer to the regulated allowable maximum diameters than bats produced using any other manufacturing process. Also, reducing barrel wall thickness **10** is directly related to lower transverse <u>or radial compression</u> stiffness in barrel portion **2** and thus to increased trampoline effect and increased bat performance. However, decreasing barrel wall

thickness **10** to improve performance is offset by a decrease in durability. Precise control of barrel wall thickness **10**, as achieved by bats manufactured using the applicant's precision molding process as described herein, allows for optimally thinner barrel wall thickness **10** for a given acceptable durability. Further, the low and consistently precise dimensional tolerances of the applicant's precision molding process, result in much tighter weight tolerances, which allow consistent and accurate bat moments of inertia, resulting in consistent feel and swing weight, highly favoured by players using bats in all bat categories.